GB

NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

ICS 77.140.01
H 40

GB/T 8731-2008

Replacing GB/T 8731-1988

Free-cutting Structural Steel

易切削结构钢

Issued on: September 11, 2008 **Implemented on: May 01, 2009**

Jointly issued by: General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ); Standardization Administration (SAC) of the People's Republic of China.

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Foreword

This standard replaces GB/T 8731-1988 "Free-cutting Steel - Technical Requirements".

Compared with the previous standard, the main revision contents of this standard are as follows:

-- Steels such as steel plates and steel strips were added in the application scope (see Chapter 1);

-- The definition of the free-cutting structural steel was added by reference to the definition specified in ISO 683-9:1998 (see Chapter 3);

-- The classification was added (see Chapter 4);

-- The ordering information was added (see Chapter 5);

-- The table that specifies the dimensions, shape and tolerances of the hot-rolled and cold-drawn bar steels, steel wires and bright steels in the previous standard was deleted and replaced by the literal descriptions (Table 1 in 1998 edition; 6.1 in this edition);

-- The composition range of Y12Pb in the previous standard was modified; the designations that are commonly used in foreign countries such as Y08, Y45, Y15Mn, Y45MnS, Y08Pb were added; some designations such as Y08Sn, Y15Sn, Y45Sn and Y45MnSn of the patent ZL 03 1 22768.6 AND the designations that are being manufactured and used by domestic manufacturers such as Y08MnS, Y35Mn, Y45Mn and Y45MnSPb were added (See Table 1, Table 2 and Table 3);

-- The finished product composition tolerance of the unspecified tin and sulfur element exceeding the specified range in GB/T 222 were added (see Table 5);

-- The requirements of the smelting process were added (see 7.2);

-- Delivery in the bright condition was added in the article of the delivery condition (see 7.3);

-- The requirements of the tensile mechanical property for steels in the previous standard was modified; the must-be-ensured value was changed to be the reference value and was listed in Appendix A (Table 3, Table 4, Table 5 and Table 6 in 1998 edition; Appendix A in this edition);

-- The requirements of the surface quality was modified; the depth of the allowable defects on the surface of steels such as hot-rolled bar steels, wire rods and hot forged components was quoted from the relevant requirements of GB/T 699; the bright steel was implemented by the relevant requirements of GB/T 3207; the requirements of the surface quality for steel plates and steel strips were added (2.7

in 1988 edition; 7.9 in this edition);

-- Appendix B, the corresponding relationship between the specified designations in this standard and the foreign-countries relevant designations, was added.

Appendix A and Appendix B of this standard are informative.

This standard was proposed by China Iron and Steel Association.

This standard shall be under the jurisdiction of the National Technical Committee on Iron and Steel of Standardization Administration of China.

Drafting organizations of this standard: Shougang Group, Dongbei Special Steel Group CO., LTD., Guiyang Special Steel Co., Ltd., Qingdao Iron and Steel Group CO., LTD., and China Metallurgical Information and Standardization Institute.

Chief drafting staffs of this standard: Gong Cui, Zhu Chen, Wang Liping, Yang Liu, Zhang Chunhong, Zhou Yinghao, Tian Qiaoli, and Zhang Qizhu.

The previous edition replaced by this standard is as follows:

-- GB/T 8731-1988.

Introduction

The issuing organization of this standard calls attention to the following fact: When claiming that it complies with this standard, it may use the relevant patents related to the relevant tin-bearing free-cutting structural steel in Table 3, namely, the designations Y08Sn, Y15Sn, Y45Sn and Y45MnSn.

The issuing organization of this standard has no opinion to the scope, validity and verification materials of patents.

The patent holder has already guaranteed to the issuing organization of this standard that he/she is willing to negotiate with any applicant about the application authorization license, under the reasonable and non-discrimination provisions and conditions. In this respect, the statement of this patent holder has already been recorded in the issuing organization of this standard. The relevant information may be obtained from the following address:

Patent name: "Tin-bearing Free-cutting Structural Steel"

Patent number: ZL 03 1 22768.6

International patent main classification number: C22C 38/04

Patent holder: Shougang Group

Contact person: Zhu Chen

Communication address: Shougang Research Institute of Technology, Shijingshan District, Beijing, China

Post code: 100041

Please note that except the above-mentioned identified patent, some contents of this standard may involve in patents; the issuing organization of this standard shall not undertake the responsibility of identifying these patents.

Free-cutting Structural Steel

1 Scope

This standard specifies the scope, terms and definitions, ordering information, dimensions, shape, weight and tolerances, technical requirements, test methods, inspection rules, packing, marking and quality certificate of free-cutting structural steels.

This standard is applicable to steels such as bar steels, wire rods, steel wires, steel plates, and steel strips that are used for mechanical machining. Their chemical compositions are also applicable to ingots, billets and their products.

2 Normative References

The following normative documents contain provisions which, through reference in this text, constitute provisions of this national standard. For dated references, subsequent amendments (excluding corrigendum) or revisions of these publications do not apply. However, the parties who have entered into an agreement according to this standard are encouraged to study whether the latest edition of the normative document is applicable. For undated references, the latest edition of the normative document referred to applies.

GB/T 222 Permissible Tolerances for Chemical Composition of Steel Products

GB/T 223.3 Methods for Chemical Analysis of Iron, Steel and Alloy - The Diantipyrylmethane Phosphomolybdate Gravimetric Method for the Determination of Phosphorus Content

GB/T 223.11 Methods for Chemical Analysis of Iron, Steel and Alloy - The Ammonium Persulfate Oxidation Volumetric Method for the Determination of Chromium Content

GB/T 223.12 Methods for Chemical Analysis of Iron, Steel and Alloy- The Sodium Carbonate Separation - Diphenyl Carbazide Photometric Method for the Determination of Chromium Content

GB/T 223.19 Methods for Chemical Analysis of Iron, Steel and Alloy. The Neocuproine-chloroform Extraction Photometric Method for the Determination of Copper Content

GB/T 223.23 Iron Steel and Alloy - Determination of Nickel Content - The Dimethylglyoxime Spectrophotometric Method

GB/T 223.29 Methods for Chemical Analysis of Iron, Steel and Alloy - The Xylenol

Orange Photometric Method for Determination of Lead Content after Carrier Precipitation

GB/T 223.50 Methods for Chemical Analysis of Iron, Steel and Alloy - The Phenylfuorone-CTMAB Direct Photometric Method for the Determination of Tin Content

GB/T 223.58 Methods for Chemical Analysis of Iron, Steel and Alloy - The Sodium Arsenite-sodium Nitrite Titrimetric Method for the Determination of Manganese Content

GB/T 223.59 Methods for Chemical Analysis of Iron, Steel and Alloy. The Reduced Molybdoantimonyl Phosphoric Acid Photometric Method for the Determination of Phosphorus Content

GB/T 223.60 Methods for Chemical Analysis of Iron, Steel and Alloy. The Perchloric Acid Dehydration Gravimetric Method for the Determination of Silicon Content

GB/T 223.61 Methods for Chemical Analysis of Iron, Steel and Alloy. The Ammonium Phosphomolybdate Volumetric Method for the Determination of Phosphorus Content

GB/T 223.62 Methods for Chemical Analysis of Iron, Steel and Alloy. The Butyl Acetate Extraction Photometric Method for the Determination of Phosphorus Content

GB/T 223.63 Methods for Chemical Analysis of Iron, Steel and Alloy. The Sodium (Potassium) Periodate Photometric Method for the Determination of Manganese Content

GB/T 223.64 Methods for Chemical Analysis of Iron, Steel and Alloy. The Flame Atomic Absorption Spectrometric Method for the Determination of Manganese Content

GB/T 223.67 Iron Steel and Alloy-Determination of Sulfur Content - Methylene Blue Spectrophotometric Method

GB/T 223.68 Methods for Chemical Analysis of Iron, Steel and Alloy - The Potassium Iodate Titration Method after Combustion in the Pipe Furnace for the Determination of Sulfur Content

GB/T 223.69 Iron Steel and Alloy-Determination of Carbon Contents - Gas-volumetric Method after Combustion in the Pipe Furnace

GB/T 223.71 Methods for Chemical Analysis of Iron, Steel and Alloy. The Gravimetric Method after Combustion in the Pipe Furnace for the Determination of Carbon Content

GB/T 223.72 Iron Steel and Alloy - Determination of Sulfur Content-Gravimetric Method

GB/T 223.74 Methods for Chemical Analysis of Iron, Steel and Alloy - The Combustion Gravimetric/Gas-volumetric Method for the Determination of Combined Carbon Content

GB/T 223.77 Methods for Chemical Analysis of Iron, Steel and Alloy. The Flame Atomic Absorption Spectrometric Method for the Determination of Calcium Content

GB/T 224 Determination of Depth of Decarburization of Steel

GB/T 226 Etch Test for Macrostructure and Defect of Steels

GB/T 228 Metallic Materials - Tensile Testing at Ambient Temperature (GB/T 228-2002, eqv ISO 6892:1998)

GB/T 229 Metallic Materials - Charpy Pendulum Impact Test Method (GB/T 229-2007, ISO 148-1: 2006, MOD)

GB/T 231.1 Metallic Materials - Brinell Hardness Test - Part 1: Test Method (GB/T 231.1-2002, eqv ISO 6506-1:1999)

GB/T 247 General Rule of Acceptance, Package, Mark and Certification for Steel Plates (Sheets) and Strips

GB/T 342 Dimension Shape Mass and Tolerance for Cold-drawn Round Square and Hexagonal Steel Wires

GB/T 702 Hot-rolled Steel Bars - Dimensions, Shape, Weight and Tolerances

GB/T 708 Dimension Shape Weight and Tolerance for Cold-rolled Steel Plates and Sheets

GB/T 709 Dimension Shape Weight and Tolerances for Hot-rolled Steel Plates and Sheets

GB/T 905 Dimension, Shape, Weight and Tolerance for Cold-drawn Round, Square and Hexagonal Steels

GB/T 908 Forged Bars - Dimensions Shape Weight and Tolerances

GB/T 1979 Standard Diagrams for Macrostructure and Defect of Structural Steels

GB/T 2101 General Requirement of Acceptance, Packaging, Marking and Certification for Section Steel

GB/T 2103 General Provisions for Checking, Packing, Marking and Quality Certification of Steel Wire

GB/T 2975 Steel and Steel Products - Location and Preparation of Test Pieces for Mechanical Testing (GB/T 2975-1998, eqv ISO 377: 1997)

GB/T 3207 Bright Steel

GB/T 4336 Standard Test Method for Spark Discharge Atomic Emission Spectrometric Analysis of Carbon and Low-alloy Steel (Routine Method)

GB/T 10561 Steel Determination of Content of Nonmetallic Inclusions Micrographic Method Using Standards Diagrams

GB/T 14981 Dimensions, Shape, Mass and Tolerances for Hot-rolled Wire Rods

GB/T 15711 Steel Products - Method for Eath Test of Tower Sample (GB/T 15711-1995, neq ISO 3673: 1976)

GB/T 17505 Steel and Steel Products: General Technical Delivery Requirements (GB/T 17505-1998, eqv ISO 404: 1992)

GB/T 20066 Steel and Iron - Sampling and Preparation of Samples for the Determination of Chemical Composition (GB/T 20066-2006, ISO 14284:1996, IDT)

GB/T 20123 Steel and Iron - Determination of Total Carbon and Sulfur Content Infrared Absorption Method after Combustion in an Induction Furnace (Routine Method)

GB/T 20125 Low-alloy Steel - Determination of Multi-element Contents - Inductively Coupled Plasma Atomic Emission Spectrometric Method

3 Terms and Definitions

The following terms and definitions are applicable to this standard.

3.1

Free-cutting structural steel

The structural steel that has favorable machining performance because of adding higher content of sulfur, lead, calcium and other free-cutting elements.

4 Classification

Steels shall be classified into the following two classes according to the different application and processing methods. The application and processing method for steel bars shall be noted in the contract; and the unnoted one shall be supplied as steels for machining.

a) Steels for press working UP

amount of pockmarks. The depth shall not be greater than the half of the tolerance calculated from the actual dimension; as required by the purchaser, the depth may not be larger than one quarter of the tolerance.

The surface of cold drawn bar steels and steel wires with Grade 11 precision used for machining may have such scratches, pockmarks, concave pits and cleaned marks of which the depth is not larger than the half tolerance calculated from the actual dimension; and may have individual tiny hair cracks no larger than the half tolerance, but the dimension of bar steels shall not be less than the minimum dimension.

7.9.4 The surface quality of the bright steel shall meet the requirements of GB/T 3207.

7.9.5 The surface of steel plates and steel strips shall be free from cracks, bubbles, scars, folds, inclusions and embedded iron oxide scales. The steel plates shall be free from sub-layers.

The surface of steel plates and steel strips may have such thin layer of iron oxide scales, iron rust, in-apparent rough surfaces caused by falling of embedded iron oxide scales, scratches, impressions and other local defects without affecting the surface defect inspection, but the depth shall not be greater than half of the thickness tolerance and the minimum thickness of steel plates shall be ensured.

The surface defects of steel plates and steel strips may be re-grinded and cleaned, but the minimum thickness of steel plates shall be ensured. The re-grinded and cleaned point shall be smooth without edges and corners.

The steel strips with defects may be delivered, but the length of the defective part shall not exceed 8% of the total length of each roll of steel strips.

8 Test Methods

8.1 The inspection items, sampling quantity, sampling positions and test methods of each batch of steels shall be in accordance with those specified in Table 9.

Table 9 Inspection Items, Sampling Requirements and Test Methods

No.	Inspection item	Sampling quantity /piece	Sampling position	Test method
1	Chemical composition	1/furnace	GB/T 20066	GB/T 223, GB/T 4336, GB/T 20123, GB/T 20125
2	Tensile test	Bar steel: 1 Wire rod and steel wire: 2 Steel plate and steel strip:1	GB/T 2975 Bar steel: ends of any steel Wire rod and steel wire: any two coils Steel plate: any piece	GB/T 228

The sampling quantity for steel inspection shall be in accordance with those specified in Table 9.

9.4 Re-inspection and judgement rules

The re-inspection and judgement rules shall be carried out according to the relevant requirements of GB/T 17505 or the requirements of the agreement reached by supplier and the purchaser.

10 Packing, Marking and Quality Certificate

10.1 Packing, marking and quality certificate of bar steels and wire rods shall comply with those specified in GB/T 2101.

10.2 Packing, marking and quality certificate of steel wires shall comply with those specified in GB/T 2103.

10.3 Packing, marking and quality certificate of bright steel shall comply with those specified in GB/T 3207.

10.4 The steel plates and steel strips shall be in accordance with those specified in GB/T 247.

10.5 For the cold drawn bar steels cut by using shearers, the bar steels shall be packed such that the ends deformed by cutting shall be toward a same-direction.

GB/T 8731	JIS G 4804	ASTM A 29/A 29M	TOCT 1414	ISO 683-9
Y45Ca	-	-	-	

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